Advisory Committee on Advanced Television Service

PS/WP-4 SAT DOC 2

Planning Subcommittee

Working Party 4 -- Alternative Media Technology and Broadcast Interface

Working Group on Satellite ATV Testing

CHARTER

The PS/WP-4 Working Group on Satellite ATV Testing (formerly the SBCA Working Group on Satellite Testing of ATV), affirms that the technical evaluation of ATV systems under consideration for the terrestrial ATV standard shall include transparency and sensitivity tests to determine the system's suitability for satellite transmission. The working group shall develop a theoretical analysis of proposed ATV transmission systems and a conceptual test plan upon which detailed test procedures shall be based. The implementation of the tests shall be coordinated by the working group under the guidance of PS/WP-4, with cooperative efforts from various members of the satellite communications industry. The tests would be designed to ascertain key parameters that affect satellite delivery of ATV to commercial redistribution systems (e.g. Cable TV, SMATV, MMDS), and to small aperture antennas in both the C-Band and Ku-Band direct-to-home environments and international satellite links.

The satellite-specific tests shall be conducted by the working group within a timetable that allows for the collection of data and compilation of a report no later than July 31, 1992. This report will be submitted to PS/WP-4 and SS/WP-4 (Working Party on System Standards) to assist them in the evaluation of various ATV systems.

FCC ACATS Planning Subcommittee
Working Party 4 - Alternative Media Technology

Working Group on Satellite Testing of Advanced Television Systems

Progress Report

The PS/WP-4 Working Group on Satellite ATV Testing comprises substantially the same membership as the SBCA Working Group on Satellite Testing of ATV. Our active members and their companies are listed in PS/WP4 SAT 11. We have met 4 times since the group's inception in July, 1991.

The group's main objective is to evaluate the ATV systems being considered as the terrestrial ATV transmission standard to determine their suitability for satellite transmission. These and other objectives are described in our charter (Attached PS/WP4 SAT-2).

The Working Group developed a conceptual test plan and timetable (PS/WP4 SAT-3) for evaluating the transparency and sensitivity of proposed satellite ATV systems. Using the conceptual test plan as a guide, the group intended to develop another document which would prescribe a standardized step-by-step testing procedure. The test results were to be summarized in a final report due by July 31, 1992.

It was found that, due to uncertainties in the availability of prototype ATV systems, satellite simulators, program test materials and the necessary funds for testing implementation, it would be unrealistic to expect a full-blown comparative test in the short time period available. Furthermore, some proponents questioned the wisdom of spending so much time, money and effort in such a short timeframe.

Harry Thibedeau of the SBCA reported the group's progress, as well as the above difficulties to Mr. Flaherty and Mr. Horowitz, chairs of the ACATS Planning Subcommittee and the Working Party on Alternative Media, respectively. Subsequently, the Working Group was invited to serve under the ACATS Planning Subcommittee umbrella and, in order not to impose undue delays in the ACATS standardization process, it was suggested that the evaluation process be confined to "paper" studies. The members accepted the invitation and generally agreed with the suggestion. Virgil Conanan of HBO now serves as Chairman and Harry Thibedeau of SBCA as Vice Chairman.

In recent meetings, the group developed a comprehensive list of space segment and ground segment parameters for satellite transmission which define a standardized transmission environment for theoretical analysis of proposed ATV transmission systems (PS/WP4 SAT 9). The proponents will be given this list of parameters and then asked to predict how well their ATV system will perform in this modelled transmission scenario. The proponents' response will provide this Working Group at least a first order estimate of compatibility with the satellite medium. If the proponents require different parameters, for example, antenna size, EIRP, transponder characteristics or modulation parameters, then they will be asked to specifically state the reason(s) for any changes.

This Working Group generally believes that this approach will be helpful to the proponents, it will not impose delays in the standardization process and should allow the group to generate a timely report to ACATS by July 31, 1992.

The future work of the PS/WP4 Working Group on Satellite Testing of ATV will concentrate on the determination of key parameters that affect satellite delivery of ATV to commercial redistribution systems (e.g. Cable TV, SMATV, MMDS), international satellite links, and to small aperture antennas used in the C-Band and Ku-Band direct-to-home environments. Both current and next generation satellites will be considered.

ATV SYSTEM _____

	Current Generation Satellites			Next Generation Satellites			
	C-Band	Ku-Band	DBS	C-Band	Ku-Band	DBS	
I. Uplink							
1. Antenna size							
2. Antenna efficiency							
3. Antenna Gain							
4. Radiation pattern: (for finding C/I using 5-sat model at 2 and 3 deg spacing							
5. Total G/T							
6. C/No							
7. ERP							
8. Uplink path loss							
II. Space Segment							
1. Orbital location of desired satellite							
2. EIRP (dBW)							
3. Parameters of desired transponder							Working Group Info
1. Amplitude response							
2. Phase response without doppler shift							
3. Phase response with doppler shift							
4. Phase noise							
5. Usable transponder (3dB) bandwidth							
6. Spectral shape of usable xpdr BW							
7. AM-PM conversion							
8. AM-AM conversion							
4. Parameters of interfering satellite(s)							
1. Saturated transponder, FM-NTSC							
2. Saturated transponder, ATV							
3. Cross Pol (inter-satellite)							
4. Satellite spacing							
5. EIRP (dBW, all sats of equal power)							
6. C/I Model: 5-Satellite constellation							
7. Worst-case inter-sat polarization skew							
5. Downlink path loss							
6. Cross Polarization Isolation (intra-satellite)							
7. Saturated flux density							
8. G/T							
9. Total C/I (power summation)							
III. System							
1. Noise margin							
2. Rain margin							
3. Pointing and implementation losses							
IV. Receive earth station							
1. Antenna size							
2. Antenna efficiency							
3. Antenna Gain							
4. Radiation pattern: (for finding C/I using 5-sat model at 2 and 3 deg spacing							
5. G/T							
6. C/No							
7. Eb/No							
8. BER at stated Eb/No							
V. ATV system performance							
1. Is IV.7. & IV.8. above threshold? (Y/N) [define threshold]							Proponent Info
2. If IV.7. & IV.8. above threshold, state system's margin							
3. If IV.7. & IV.8. below threshold, state minimum antenna size required to attain threshold							

Working Group on Satellite Testing of Advanced Television Systems

MEMBERSHIP LIST

Marion Baraniecki, Intelsat
Paul Beeman, TVN
Gerald Chouinard, CRC, Department of Comm.-Ottawa
Richard Citta, Zenith
Virgil Conanan, HBO
Roger Godin, Hughes Communications
Len Golding, Hughes Network Systems
Richard Gould, Telecommunications Systems, Inc.
Paul Hearty, ATEL
Paul Heimbach, Viacom
Brian James, Cable Labs
Scott Keneman, Sarnoff Labs
Dick Klensch, Sarnoff Labs
Jeff Krauss, GI
Keeichi Kubota, NHK
Bernard Lechner, Consultant
Lin-Nan Lee, Comsat Labs
Dan Leed, AT&T
Phil Lucachick, USSB, Inc
Fred Markhauser, Telsat Canada
Peter Nuspl, Intelsat
Roger Pence, NCTA
Ashok Rao, Comsat Labs
Robert Rast, GI
Ed Reinhart, Consultant
Paul Snopko, Zenith
Kou-Hu Tzou, Comsat Labs
David Weinreich, Comsat Labs
Dan Wells, Comsat
Dwaine Williams, Satellite Sports Networks

Advisory Committee on Advanced Television Service

PS/WP-4 SAT DOC 4

Planning Subcommittee

Working Party 4 -- Alternative Media Technology and Broadcast Interface

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DOCUMENT LIST

PS/WP-4 SAT 1 -- Second Report From SBCA Working Group on Satellite Testing of ATV, December 18, 1991

PS/WP-4 SAT 2 -- CHARTER - PS/WP-4 Working Group on Satellite ATV Testing January 7, 1992

PS/WP-4 SAT 3 -- Conceptual Test Plan, January 7, 1992

PS/WP-4 SAT 4 -- Document list, January 7, 1992

PS/WP-4 SAT 5 -- Fax letter Ed Horowitz/Joseph Flaherty regarding PS/WP-4 appointment

PS/WP-4 SAT 6 -- Cover letter to SBCA Working Group dated January 9, 1992

PS/WP-4 SAT 7 -- Fax memo to Richard Wiley, Joseph Flaherty, and Ed Horowitz, January 9, 1992

PS/WP-4 SAT 8 -- Minutes of SBCA Working Group Conference call, January 24, 1992

PS/WP-4 SAT 9 -- Characterization of Satellite Operating Environment and Minimum Antenna, size for ATV, January 30, 1992

PS/WP-4 SAT 10 -- Progress Report, Working Group on Satellite Testing of Advanced Television Systems, January 30, 1992

PS/WP-4 SAT 11 -- Membership list, Working Group on Satellite Testing of Advanced Television Systems, January 30, 1992

PS/WP-4 SAT 12 --

PS/WP-4 SAT 13 --

PS/WP-4 SAT 14 --

Second Report PS/WP-4 SAT DOC 1

From

SBCA Working Group on Satellite Testing of ATV

December 18, 1991

Introduction

The SBCA Working Group on Satellite Testing of ATV held its third meeting by teleconference on Wednesday, 18 Dec 1991. The participants were:

Virgil Conanan, HBO
Marion Baraniecki, Intelsat
Kou-Hu Tzou, Comsat Labs
Paul Beeman, TVN Entertainment
Daniel Leed, AT&T Bell Labs
Richard Citta, Zenith
Robert Rast, GI
Richard Klench, Sarnoff Labs
Bernie Lechner, Consultant
Harry Thibedeau, SBCA

The conference call commenced at 1:05pm (ET).

Harry Thibedeau opened the meeting by updating participants on the progress of the Working Group. He indicated that the strategic statement and conceptual test plan had been sent to all proponents and to other interested parties. Thibedeau also informed the group that the plan had been discussed at the PS/WP-4 meeting held on December 17th. He also indicated that a letter had been sent to Joseph Flaherty chairman of FCC ACATS planning subcommittee, requesting access to the ATTC test materials (attached).

Thibedeau said that as a result of the PS/WP-4 presentation, Joseph Flaherty has requested that the SBCA Working Group be officially established as a Working Group under Ed Horowitz's Specialist Group on Alternatives media PS/WP-4. Thibedeau also noted that Horowitz had appointed Virgil Conanan as the chairman of the Working Group. Virgil has tentatively accepted the position subject to final management approval. Thibedeau also noted that Virgil has requested that he (Thibedeau) serve as Vice-Chair of the Working Group.

Thibedeau then explained a proposal from ED Horowitz which called for the Working Group to focus on conducting a "paper study" of the technical parameters of Satellite delivery of ATV as an alternative to actual physical testing of each system. This

proposal was advanced as a result of the limited time and resources available to the proponents and the Working Group.

Following extensive discussion, the Working Group generally agreed that some level of system evaluation beyond a "paper study" should be done.

The proponent representatives--Klench (Sarnoff), Rast (GI), and Citta (Zenith) all indicated that while they support the concept of satellite testing, their concern is one of timing and resources. All three indicated that their companies would likely conduct in-house satellite test of their own systems.

Discussion turned to the possibility of conducting a three-phase test program. Phase one would start a "paper study," or a theoretical analysis of how proposed systems could deliver ATV to various sizes of satellite antennas. The study would include determination of satellite system models, baseline parameters and link budget margins of existing satellites and next generation satellites. Proponents would then be asked to "certify" that their systems could operate under these modeled (hypothetical) conditions.

The second phase would involve limited "on-site" testing of the ATV systems at the proponent's preferred lab, using a test procedure written by the working group and approved and agreed to by the proponents. A set of standard interference generators would be shipped to the proponents. Tests would then be conducted by the proponents under the supervision of impartial observers. The test results would be submitted to the Working Group, then subsequently reported to PS/WP-4 and SS/WP-4.

The third and final phase would involve an "end-to-end" test of the system chosen for field test. This test could perhaps be done in conjunction with Cable Labs which plans similar tests using a typical cable system downlink.

Robert Rast questioned the ultimate goal of the Working Group. He asked whether the Group intended conduct competitive tests of the systems, or if it wished to test the systems simply to insure that none of them possessed characteristics which would impose significant negative impacts on the Direct-to-the-home (DTH) industry. Extensive discussion ensued. Rast warned the group that whichever course they decided to follow, they must be sure that the Advisory Committee agrees to accept the report of the Working Group. Further discussion ensued.

Virgil Conanan proposed the following action items which were generally agreed upon by the Working Group:

A) Verify that all proponents agree to submit their systems to competitive satellite testing.

B) Verify that the Advisory Committee will accept the results of competitive satellite tests of the proponent systems.

C) Determine from the proponents if they have a specific system design for satellite delivery. If not, determine how they intend to interface their systems for satellite delivery.

D) Develop a theoretical analysis and a standardized detailed test plan which will be conducted by the proponents and witnessed by neutral parties.

E) Collect the test data and prepare the necessary reports to PS/WP-4 and SS/WP-4.

The target date for this report is July 31, 1992. It is understood that the test data from the 6th proponent system will likely not be available at that time.

The conference call ended at 3:40 pm.

CONCEPTUAL TEST PLAN PS/WP-4 SAT 3

I. Determine Response of Proponent Systems to:

- A. Thermal Noise
- B. Intermodulation Noise
- C. Analog and Digital Interferences (ATV <---> Others)
    1. Adjacent Channel Interference (ACI)
    2. Cross-Polarization Interference (XPI)
    3. Co-Frequency/Co-Pol Adjacent Satellite Interference (ASI)
- D. Gain & Delay EQ
- E. Rain Fades

II. Satellite Transmission Modes

- A. Single Carrier @ Transponder (at various Back-offs)
- B. Multiple Carriers @ Transponder (at various Back-offs)

III. Perceptual Evaluation Criteria

- A. Threshold of Visibility (T.O.V.)
- B. Point of Unusability (P.O.U.)
- C. Threshold Performance

IV. Numerical Indices of Performance

- A. E(b) / N(total) at T.O.V.
- B. E(b) / N(total) at P.O.U.

C. E(b) / N(total) margin for a "standard" set of interference, intermodulation, and thermal noise levels

D. Error Distribution Statistics

E. Image quality vs corrected B.E.R.

Test Venue

The Working Group proposes that the tests be conducted at the proponent's laboratory.

The Working Group also does not recommend the use of a transportable earth station to conduct "real-world" tests over satellite from the various proponent facilities for the following reasons: 1) Lack of repeatability/uncontrolled environment, 2) Limits this would place on the number and types of tests which could be conducted, 3) Level of coordination required in testing with actual satellites, and 4) Risk of accidentally disturbing existing service traffic.

Test Bed Equipment Currently Available

I. Satellite Simulator & Associated Instrumentation

II. Various Interference Sources, e.g., FT, Analog FM TV, PRN

III. Digital Video Tape Recorder (Playback & Display)

IV. ATV Signal Generator/Analyzer

Test Equipment Required

1. Digital Video Tape Recorder(s)

2. Digital Video Tape

3. ATV System under test

4. Satellite Modem and Error Coding

5. Video Display Equipment

6. Format Converter

ATTC Supplied Equipment

Test Materials

Timetable for Testing: 60 days

_____	---	Begin Test Bed Development, write detailed test plan
February 1, 1992	---	Simultaneous Testing of ATV Systems
July 31, 1992	---	Draft Report due to Working Group
August 14, 1992	---	Final Report submitted to PS/WP-4 & SS/WP-4

BUDGET

To Be Determined

Satellite Broadcasting and Communications Association

PS/WP-4 SAT DOC 5
January 7, 1992

TO: Mr. Ed Horowitz, Viacom
Mr. Joseph Flaherty, CBS

FR: Harry W. Thibedeau, SBCA

RE: Satellite Testing of ATV Systems

Here is an update on the efforts of the SBCA Working Group on Satellite ATV Testing. As you know, this group was created by the SBCA Board of Directors in November, 1991.

The Working Group has held three meetings and has developed a charter which is attached for your review. A conceptual test plan for satellite ATV testing has also been completed. On December 17, 1991, the SBCA presented these materials to PS/WP-4.

It is the earnest desire of the SBCA Working Group that data concerning the unique characteristics of satellite transmission be available for consideration by the Advisory Committee. Thus, the SBCA Working Group on Satellite ATV Testing is requesting formal appointment as a Working Party under PS/WP-4. This will allow the activities of the Working Party to be conducted in close coordination and consultation with PS/WP-4 and the Advisory Committee. We will conduct these activities in a manner so as not to adversely affect the test schedule already created by the Advisory Committee.

Should you be favorably inclined to grant this request, we would urge you to appoint Mr. Virgil Conanan of HBO as the Chairperson of the Working Party. He has demonstrated strong leadership in our activities to date, and the SBCA highly recommends him for this important position.

The SBCA Working Group stands ready to help the Advisory Committee in its challenging task. We understand the role that we will serve in this process. The group pledges to conduct its business in a manner which will not delay or impose significant expense upon the ATV selection process.

Please call me if you have any questions. I look forward to hearing from you.

225 Reinekers Lane, Suite 600 • Alexandria, Virginia 22314 • Phone: (703)549-6990 • Fax: (703)549-7640

Satellite Broadcasting and Communications Association

PS/WP-4 SAT DOC 7
January 9, 1992

TO: Mr. Richard Wiley
Mr. Joseph Flaherty
Mr. Edward Horowitz

FR: Mr. Harry W. Thibedeau

RE: Satellite Testing of ATV

To assist in your consideration of the request submitted by the SBCA Working Group on Satellite Testing of ATV for formal inclusion in the FCC ACATS process, I am forwarding you the following documents:

PS/WP-4 SAT DOC 1 -- Second Report From SBCA Working Group on Satellite Testing of ATV, December 18, 1991

PS/WP-4 SAT 2 -- CHARTER - The PS/WP-4 Working Group on Satellite ATV Testing, 7 Jan. 1992

PS/WP-4 SAT 3 -- Conceptual Test Plan, 7 Jan. 1992

PS/WP-4 SAT 4 -- Document List, 7 Jan. 1992

I hope these documents will provide the information you need. Should you have any further questions, please feel free to contact either Virgil Conanan or myself.

225 Reinekers Lane, Suite 600 • Alexandria, Virginia 22314 • Phone: (703)549-6990 • Fax: (703)549-7610

Satellite Broadcasting and Communications Association

PS/WP-4 SAT DOC 6
January 9, 1992

TO: SBCA Working Group on Satellite Testing of ATV

Bernard Lechner	609/924-7547
Lin-Nan Lee	301-428-7747
Peter Nuspl	202/944-7898
Marion Baraniecki	202/944-7115
Ed Reinhart	703/448-5920
Paul Hearty	613/592-4398
Gerald Chouinard	613-993-9950
Brian James	548-5750
Dan Wells	301/428-3285
Roger Godin	213/607-4612
Phil Lucachick	612/642-4103
Fred Markhauser	613/748-8712
Dwaine Williams	214/660-5755
Paul Beeman	516/277-6080
Virgil Conanan	212/512-5598
Len Golding	301-601-2550
Paul Heimbach	212/258-6354
Ashok Rao	301/428-7747
Richard Gould	202/223-4450
Dan Leed	908/949-8082
Roger Pence	202/775-3698
Richard Citta	708/391-8555
Scott Keneman	609/734-2901
Robert Rast	619/535-2485
Jeff Krauss	301/309-9323
Keeichi Kubota	212/489-9559

FR: Harry W. Thibedeau, SBCA

Total number of pages ___12___

Here is an update on our activities to this point:

1) Progress is being made toward appointment of the SBCA Working Group as an official part of the FCC ACATS process. We expect to have a decision on the issue by early next week. If our request is approved, the SBCA Working Group will become known as "The PS/WP-4 Working Group on Satellite Testing of ATV."

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2) In anticipation of appointment under PS/WP-4, we must now begin the assignment of document numbers to all materials produced by the Working Group. **All documents submitted to the group and subsequently assigned document numbers will become public record.**

3) Modifications have been made to the Conceptual Test Plan and the Strategic Statement (hereafter known as the Charter). The changes to the test plan are a result of our 12/18/91 teleconference.

4) Please review the following documents:

PS/WP-4 SAT 1 -- Second Report From SBCA Working Group on Satellite Testing of ATV, December 18, 1991

PS/WP-4 SAT 2 -- CHARTER - The PS/WP-4 Working Group on Satellite ATV Testing, Jan. 7, 1992

PS/WP-4 SAT 3 -- Conceptual Test Plan, Jan. 7, 1992

PS/WP-4 SAT 4 -- Document List, Jan. 7, 1992

PS/WP-4 SAT 5 -- Faxed letter to Ed Horowitz/Joseph Flaherty requesting official ACATS appointment, Jan. 7, 1992

5) We must meet again soon. An agenda and the venue for the next meeting will be distributed next week.

Thank you again for your work on this project.

HWT

PS/WP4 SAT 8

SBCA WORKING GROUP ON SATELLITE TESTING OF ATV SYSTEMS

CONFERENCE CALL

January 24, 1992

Participants

Virgil Conanan, HBO, Chairman
Dan Leed, AT&T
Phil Lucachick, USSB
Roger Godin, Hughes Communications
Kou-Hu Tzou, Comsat Labs
David Weinreich, Comsat Labs
Bernie Lechner, Consultant
Dick Klensch, Sarnoff Labs
Paul Beeman, TVN
Robert Rast, GI
Marion Baranecki, Intelsat
Harry Thibedeau, SBCA

The call commenced at 2:00 PM (ET).

Virgil Conanan briefed the Working Group on the status of our request for appointment as an official part of the ACATS process. He indicated that Richard Wiley, Joseph Flaherty, and Ed Horowitz had met recently to discuss the issue. A formal letter of appointment from Horawitz to the Working Group is expected shortly. The SBCA Working Group would then become the PS/WP-4 Task Force on Satellite Testing of ATV. It would report directly to Ed Horowitz.

Conanan indicated that Horowitz would like the group to limit its inquiry to a "paper study" if at all possible. This would allow for the collection of data and the submission of a report to ACATS without imposing delays upon the testing program.

Conanan indicated that the first step in this "paper study" is to supply the proponents with a characterization of the satellite operating environment. This characterization would cover C-Band, along with FSS and BSS Ku-Band satellites. Characterizations of both the current generation and the next generation satellite fleet would be provided to the proponents.

Conanan said that once the characterization document was approved, it would submitted to the proponents. They would then be asked to calculate their system performance in each of

the environments. The proponents will be asked to calculate the minimum antenna size required to operate in each environment, and to calculate the margin they will have with that size antenna.

Extensive discussion ensued over the specific line items contained in the characterization document.

It was generally agreed that the characterizations should be of the "worst case" environment reasonably expected to exist. It was also generally agreed that the characterization document be divided into five specific areas: (1) Uplink, (2) Space Segment, (3) System, (4) Receive earth station, and (5) ATV system performance.

Virgil Conanan indicated that he would re-draft the characterization chart, incorporating the various changes suggested by the group. The revised document will then circulated to the working group for their review.

Conanan advised the group that the fifth interim report from PS/WP-4 to ACATS was due on January 31, 1992. He said that he would work with Harry Thibedeau to draft a report to Horowitz for inclusion in the PS/WP-4 document.

It was generally agreed that the next meeting of the working party should be held either the week of February 17th or 24th, and that the meeting be held at SBCA offices in Alexandria, VA.

The conference call ended at approximately 4 PM.